International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE) Vol 2, Issue 5, May 2016

Wireless Data Transmission Through Led

[1]Ashwini B N, [2]Avikumar R, [3]Jyothi M P
[1][2] Asst Prof, Dept of TE [3] Asst Prof, Dept of EIE
GSSS Institute of Engineering & Technology for Women, Mysore

Abstract: **-- Li-Fi (light-fidelity) technology is very new and was proposed by the German Physicist Harald Hass which means transmission of data through an LED light bulb that varies in intensity faster than human eye can follow. This paper aims at wireless transmission of data with the help of LED at the transmitter side and reception of data by the photodiode at the receiving side. There are two modes of operation .One is data mode ,in which the data is transmitted through LED and second one is robot mode ,in which the robot is moved in any directions with respect to the keys configured .This paper also gives information , how Wi-Fi is replaced by Li-Fi. Wi-Fi is used for general wireless coverage within buildings whereas Li-Fi is model for high density wireless data coverage in restricted areas in which there are no obstacles.. The term Li-Fi refers to VLC technology that uses as medium to deliver high-speed communication in a manner similar to Wi-Fi. Li-Fi provides better efficiency, bandwidth, availability and security than Wi-Fi and has already achieved high speeds in the lab. This paper provides a detailed explanation of Li-Fi technology, its benefits and future scope.**

***Index Terms*— Visible Light Communication (VLC), LED (Light Emitting Diode), Wi-Fi (Wireless–Fidelity).**

I. INTRODUCTION

Light Fidelity means transmission of data through illumination, by taking the fiber out of fiber optics and transmitting the data through a LED light bulb that varies in intensity faster than the human eye can follow. In total Li-Fi Technology is called Visible Light Communication (VLC). It is used for fast and cheap wireless-communication system.

"At the heart of this technology is a new generation of high brightness light-emitting diodes", says Harald Haas from the University of Edinburgh, UK; which means that, if the LED is on, the data is transmitted and it is considered as digital 1, if LED is off, then the data is not transmitted and it is considered as digital 0. It is possible to encode the data in the light by varying the rate at which the LEDs turn on and off to give different strings of 1s and 0s.The output appears constant as LEDs intensity modulates rapidly which cannot be noticed by human eye.

II. PROPOSED WORK

The basic block diagram of the implemented system is as shown in figure 1.It consists of two main blocks the VLC transmitter and VLC receiver. As needed by the project an additional RF- transceiver has been integrated with the VLC receiver to display is functionality.

A. VLC Transmitter: The computer gives the data input to the microcontroller(ATMEGA 16) through serial port.MAX-232 is 16 pin IC, which converts the signals from,RS232 serial port to signals suitable for use in TTL compatible digital logic circuit. Microcontroller receives the signal at TTL levels at various ports and converts the data into binary format. LED driver circuit is used for data transmission. Here LED acts as a light source, which transmits the binary output of the microcontroller in the form of light intensity pattern which is then transmitted.

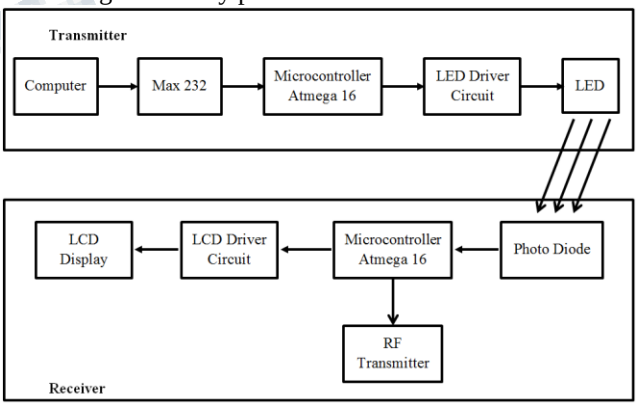

Fig.1. Basic block Diagram of implementation

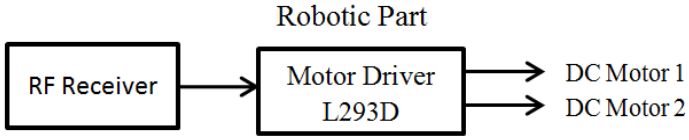

Fig. 2 – RF Receiver interfaced with a robotic part for drive by VLC based data transmission

If the produced voltage is greater than 3.3V, it is considered as logic 1 and if it is less than 0.8V, it is considered as logic 0. Reception logic: When LED is off, a negative edge interrupt is generated. Intermediate delay of 500µs and 1ms i.e. 750µs is considered. If the LED is off for a time less than 750µs, the data transmitted is considered as 1 and if LED is off for a time greater than 750µs, data transmitted is considered as 0. Once all the 8 bits are received, the binary value is converted to its corresponding ASCII value (bit to byte conversion) and displayed on the LCD.

B.ROBO Mode*:* The robot is moved according to the commands given. The robot is programmed to move left, right, forward and backward using the arrow keys. Here RF transmitter and receiver is used to transmit and receive the data and accordingly move the robot. It allows the voltage to flow in either directions to rotate the motor in clock and anticlockwise directions. The received light data is converted to 4 bit binary data and transmitted through RF transmitter and received through RF receiver on the robot.

3.4 FLOW CHART

In transmitter side the data which has to be transmitted is pressed in the keyboard. The data may be either a character or a number. The ASCII value of the pressed character or number is equivalent to one byte and that one byte is split in to 8bits and one bit is transmitted at a time. During these bits transmission LED will be turned OFF. If the transmitted bit is one, the delay will be 500 µsec. If the transmitted bit is zero then the delay will be 1000µsec. This timing logic will define whether the transmitted bit is 0or 1.After transmitting 1 bit the LED will be turned ON.

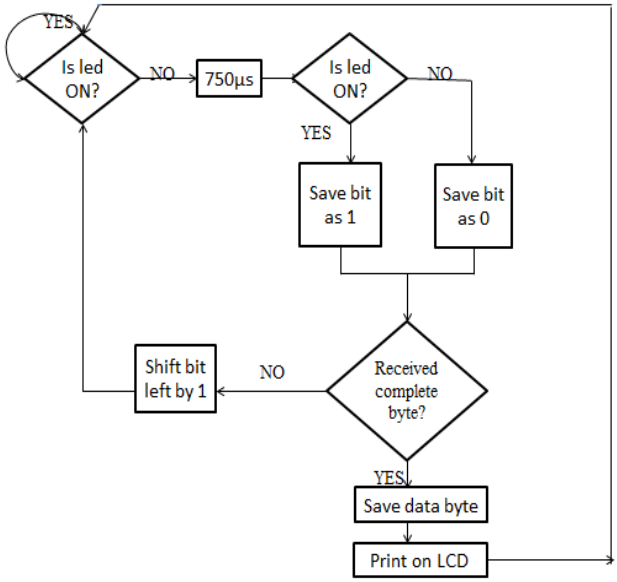

Fig. 3-Flow chart for VLC Reveiver

A delay of 10msec after each bit transmission is given. Then it will check whether all the bits are sent, if it is yes then it will check whether all the bytes are sent, if it is yes then it will go to first step of the flowchart, else it will select MSB that has not been transmitted.

In receiving side to make the receiver understand whether 0 or 1 is received, the intermediate delay of 500µs and 1000µsis taken as 750µs. First check the status of LED whether it is ON or OFF. If the LED is on keep checking until it turns off. If the LED is off, compare the LED off period with 750µs. If even after 750µs the LED is off then the received data is considered as 0. If LED is on after 750µs, then the data transmitted data is considered as 1. Then check the reception of complete byte (all the 8 bits). If all the 8 bits are received completely, it is saved and printed on the LCD screen. If not, bit is shifted left by 1 and again the process is repeated.

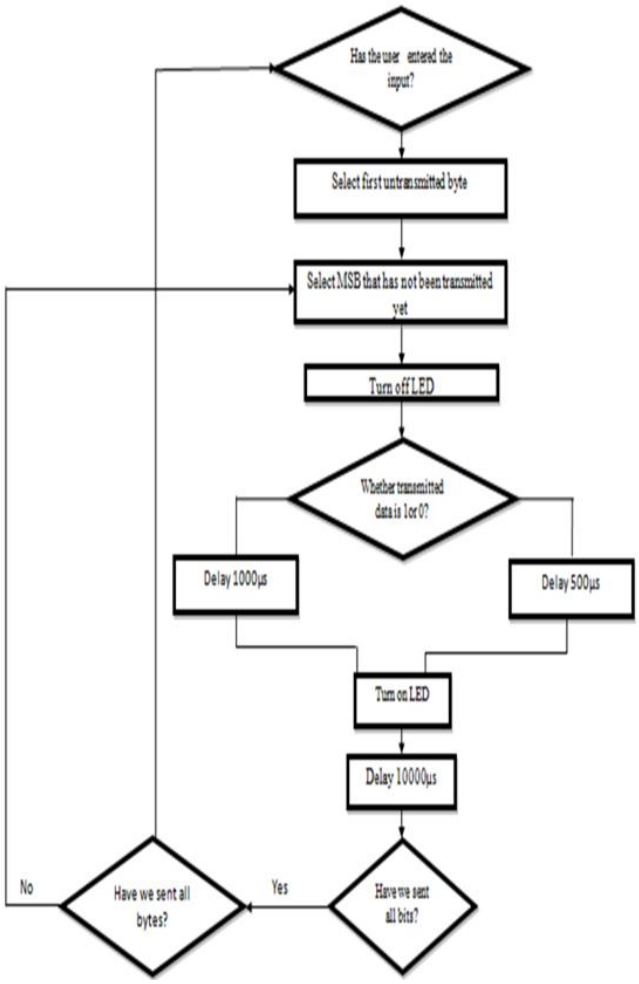

Fig. 4 – Flowchart of VLC Transmitter

IV. RESULT AND CONCLUSION

We are successful in designing wireless data transmission through LED circuit and robot is made to move left, right, forward and backward using arrow keys. When a key is pressed the ASCII value is converted into binary value and transmitted bit wise through LED and received by the photo diode. All the received bits are converted into ASCII values and displayed on the LCD.

4.1 Conclusion

LI-FI technology is one of the new technology which gives tremendous scope for future research and innovation. In our project we are transmitting the wireless data through LED as well as ROBOT control.LI-FI technology can be used practically, every bulb can be used like a WI-FI hotspot to transmit the data. It can also solves the problem of radio-frequency bandwidth. LED can transmit the data through higher rate.

Advantages Of Li-Fi Over Wi-Fi

- Very high speed, compared to WI-FI. The range is 500mbps or 30GB per minute
- Li- Fi uses light where as WI-FI radio frequency signals.
- VLC can be used safely in aircraft.
- Under water in sea Wi-Fi does not work in such places LI-FI can be used.

Limitations

In this the data transmission is possible only if the transmitter and the receiver is in line of sight. If there is any interference like striking of objects between the transmitter and receiver or any obstacle will causes the data loss. Using this photo diode may also cause interruptions due to other light sources.

Applications:

- This technology can be implemented in petroleum or chemical plants where other transmission or frequencies could be hazardous.
- This can be used in the places like hospitals where it is difficult to lay the optical fiber.
- It is used in conjunction with the Power line Communication (PLC). In this the voltage changes in an electrical wire, which serves as PLC carrier, and is reflected by the flickering of a light source.

Receiving part: Photo diode which is used to convert light into electrical signals. Those electrical signals are given to the microcontroller. Microcontroller which converts these signals into characters and through LCD driver circuit and it is displayed on the LCD.

RF Transceiver for Robot*:* Microcontroller which controls the robot through RF transmitter and RF receiver. Here we use L293D motor driver IC to drive the motor in either directions.L293D is a 16 pin IC which can control a set of 2 DC motors simultaneously in any direction. It works with the concept of H-bridge.

III.DESIGN METHODOLOGY

A. Data Mode: In the transmission part, LED is continuously on. When a key is pressed, its ASCII value is converted to its corresponding Binary value (byte to bit conversion) and the binary value is transmitted bitwise through the LED.

Transmission Logic: To transmit binary 0, LED is off for 1ms and to transmit binary 1, LED is off for 500µs and the bit to bit delay is taken as 10ms. This timing logic is to make the receiver understand whether 0 or 1 is received. Transistor is used as switch to turn on and off the transistor. In the reception part, we have photodiode which is reverse biased and it works in photoconductive mode. When photodiode is exposed to light, the voltage across the photodiode changes accordingly with the LED on and off switching. This photodiode captures the light signals from the LED and converts it into electrical signal.

REFERENCES

1. Harald Haas, Wireless data from every light bulb, TEDGlobal Jul 2011. [URL:https://www.ted.com/talks/harald_haas_wireless_data_from_every_light_bulb , dated on 12-5-2016]

2. Ghimire, Birendra, and Harald Haas. "Self-organising interference coordination in optical wireless networks." *EURASIP Journal on Wireless Communications and Networking* 2012, no. 1 (2012): 1-15.

3. Janie Condliffe,Will Li-Fi be the new Wi-Fi?, Technology News, 20 July 2011.

4. [URL:http://www.newscientist.com/article/mg21128225.400-will-lifi-bethe-new-wifi dated on 12-5-2016]Li-Fi,digiplanet-Wikipedia,

5. [URL:http://www.digplanet.com/wiki/Li-Fi dated on 14-05-2016] "Li-Fi An Introduction", [URL:http://www.scribd.com/doc/115111784/li-fi.

6. Shiv Kumar, Shrawan kumar shram , Awanit kumar, "Secure Data Transfer in Personal Area Network " Journal of Computer Science And Engineering., No. 2 (2015)

7. George Webster, 'Li-Fi' provides a light bulb moment for wireless web, CNN[URL:http://edition.cnn.com/2012/09/28/tech/lifi-haas-innovation]